Identifying the Problem

Trent researchers met with the collaborative action research teams at the start of the projects to support them in developing their research questions. At these initial planning meetings, researchers led the teams through a series of questions (adapted from Sagor, 1992, Whitehead & McNiff, 2006) designed to get participants focusing on and articulating the problems they wanted to explore. We asked the teams to reflect on and discuss the following questions:

Whose problem is this?
What evidence do you have that this is a problem?
What do you suspect is causing the problem?
What is the goal for improvement?(What is it you want to see in the students?)
What do you propose to do about the problem? (What actions could you take?)

This discussion informed the development of a problem statement (a brief statement encapsulating the problem under focus in the classroom) and corresponding research question. The problem statement, then, was the driver of the action research planning. Sagor (1992) emphasizes the importance of taking the time to clearly articulate the problem of focus. This approach imbues the research question with meaning that is directly relevant to teacher practice; it is personally and professionally significant because the direction for the research is set by the teachers based on common problems. The teachers' interest in finding solutions for these problems lent their inquiry a sense of urgency. Data indicated that "constructive urgency" was important in generating and sustaining momentum throughout the project. This involved a shared desire to improve student learning, a relatively short timeframe in which to implement strategies and measure changes, combined with the support of colleagues and researchers.

This combination of pressure and support is discussed in the Earl et al. (2003) evaluation of the Manitoba School Improvement Plan. In this longitudinal study, Earl et al. describe how the combination of pressure and support leads to what the authors describe as the *productive urgency* necessary for teacher change (especially sustained change in instructional practice). Urgency in this sense is defined as the motivation for change; the authors found that when schools experienced a pervasive feeling of urgency about the necessity for change (including a moral imperative for improving conditions for student learning), their efforts gained a surge of energy, which allowed teachers greater agency over the change process.

In the context of collaborative action research, we have come to think of teacher motivation for change as a force of *legitimate constructive urgency*, where the social constructivist framework of collaborative learning leads to teacher (and researcher) growth. Hargreaves (2000) contrasts legitimate cultures of collaboration with what he calls contrived collegiality. In legitimate collaborative cultures, according to Hargreaves, relationships are spontaneous (because they emerge from and are maintained by the teachers themselves), are voluntary, are development-oriented (the teachers establish the goals, rather than working to implement the agendas of others), and are pervasive across time and space (include formal and informal opportunities in a variety of sites). This is in contrast with contrived collegiality, which is administratively regulated, compulsory and implementation-oriented.

Planning Together

The researchers assisted teams in planning intervention strategies designed to address the problem they identified, and to plan data collection strategies suited to gathering evidence of teacher and/or student growth (often pre and post). This process was assisted by use of a template that teams filled out throughout the day.

The template provided opportunities for teams to record:

- their problem statement;
- their research question;
- a description of their intervention strategy;
- a description of their data collection strategy (teacher and student data);

- relevant literature and resources; and,
- next steps.

By completing this template on the first day, teams essentially left the first planning session with a comprehensive action research plan in place – that could easily be adjusted as needed.

In our research program overall, we have observed the success of teacher teams who follow a cyclical structure of co-planning/ co-teaching/ implementation/ debriefing with enactments (practice) in between team meetings, and so we expected to see this pattern repeat itself (and it did). One of the advantages of a cyclical structure is that regular and consistent meeting times are built in to the process, reducing the risk of disengagement resulting from passage of time or other pressures in teaching.

Types of activities observed at planning sessions included: exploring published research, teaching resources and manipulatives; reviewing math content; co-planning lessons, lesson sequences and assessment strategies, and; revisiting research questions to maintain or refine the team's focus.

Implementing Plan of Action

Bridging Theory and Practice through Classroom Interventions: The 'action' part of action research
Unlike experimental research, where the researcher seeks to observe phenomenon without influencing processes or outcomes, collaborative action researchers seek to improve a situation in a particular setting through the research process; it is action-oriented. Sagor emphasizes the action part of action research, defining it as "investigations conducted by and for the people taking the action, on their own action to inform their future actions" (2005). Of course, participant learning through the process is an equally important goal. To achieve these goals, participants carefully plan interventions that they believe (a belief informed by theory as well as professional intuition) will improve problematic areas of teaching and learning.

Experimenting with New Strategies
In this respect, collaborative action research provided an impetus for teachers to try something new that they might not otherwise have tried. This opportunity was valued by teachers, even when it created disequilibrium or pushed them beyond their 'comfort zone', as reflected in the following focus group discussion:
T1: I think the important thing is just to try different practices. This has allowed all of us I think to see things in different ways that we maybe weren't thinking before. Maybe taking small risks and realizing that it's a good thing.
T2: It's easy to get in a rut if you've been teaching a long time and you've had success and a comfort zone…it's good to have someone make you or challenge you to step outside of your comfort zone….just like it's good to get the kids to step outside of their comfort zone….so you tried something new and it didn't work. Maybe you won't do that again, but at least you tried something.
T3: That's what we teach kids. Try it, take that risk.

In some cases, these were strategies that the teachers had been curious to learn more about but hadn't had a chance to try in their classrooms. For example, one of the case study teams was curious about different consolidation methods for students, and the project provided the framework to try different strategies. One of the teachers had a strong interest in drama and the arts, and these were brought into team planning of different methods. The project provided opportunities to creatively apply teacher professional knowledge and to expand it by trying things they had been curious about but had not done before. In other cases, the project provided opportunities for teams who were interested in testing out theories from secondary research to exercise their own critical professional judgment in assessing the theories and how different pedagogical approaches met with success in the classroom. At one case study site, a team member had been reluctant about the team's approach of starting with area rather than length in the measurement strand, but others were interested in trying it and the team decided to move forward. This team member reflected at the end of the study:

> *… thinking back to the very beginning, you might remember that I was a little bit cautious about starting with area, because the research I had read said not to, but we decided to try it. And I think that's really neat to see where it has gone. And I guess that's a good lesson too that one or two pieces of research maybe isn't enough. So maybe we want to try this again, will we get the same results? (Participant, focus group interview)*

This team had gone against the grain, tried something innovative, and possibly even controversial, and met with success. For this participant, the findings of their project affirmed the professional judgment of the team. Their findings served as a reminder to look at the curriculum and educational research with a critical eye.

While experimenting with new strategies, collaborative action research also provided teachers with opportunities to see what students were truly capable of doing, which often led to revised and heighten expectations of student ability. At it's best, collaborative action research provided an opportunity to plan carefully and to teach with intent, with a focus on best practices; the depth of exploration and practice that collaborative action research allows leads to lasting enhancement of instructional practices.

Evaluating The Interventions

Our data indicates that powerful gains were made when teachers engaged in the difficult process of collecting and analyzing data to measure the effects of their interventions. The act of analyzing data related directly to the act of teaching; data analysis in the context of educational action research offered participants the opportunity to pay careful attention to students and student thinking. Many groups talked enthusiastically about learning from their students through the process of data analysis:

> *When we've seen large bodies of information collected and shared in a concise way – which we've had over these two years of being involved in the project – it makes me much more aware of what I'm going to be collecting and how I'm going to be presenting that to others. So it makes me more purposeful I think in the work that I collect and the samples I take from my students. I look at it from a different lens. (Teacher participant)*

> *I think I enjoyed it [data analysis] the most. It gets back to the heart of being a teacher again. Here's the student stuff on the table. (Teacher participant)*

Earl et al. (2003) emphasize the need for "ongoing, job-embedded and intensive experiences" of professional learning – learning that "links inquiry with habit of mind" – as "precisely the kind of learning that appears to be required" to make significant and lasting improvements in education (88). Collaborative action research provides a model for professional learning that fits all of these criteria and can provide a framework for teachers to experience and engage in transformational change.

Data Collection and Analysis

Research as a catalyst for teacher learning

By engaging in the research processes of data collection and analysis, in which teams examined teacher and student artifacts to determine the effects of their classroom interventions, teachers gained new understandings about data, its purposes and usefulness. Researchers observed a shift in participants of greater ownership of the data and the research process overall. As teachers gained familiarity and agency, they moved from perceiving 'research' as a domain that existed outside the classroom, to doing research and seeing where it fits with classroom practice.

a) Growing Teacher Independence and Comfort with Data Collection and Analysis Activity

At the beginning of the collaborative action research process, many participants were uneasy with the idea

of collecting and analyzing data and relied on researcher input and suggestions for data collection strategies (Field notes, 2008). Over time, researchers observed a shift in participants' understanding about types of data and evidence in classroom-based research. One teacher stated that she had learned that "data collection is not just numbers, not just statistics" (Final interview). With time, teachers drew on a broad range of data sources, and developed a more sophisticated understanding of types of sources in the specific context of the classroom environment that inform our understanding. For example, with the encouragement of the researchers, cycle1 included a foray into the use of video data for some teams. Though teachers may have been somewhat reluctant to use video as a data source initially, those who used it came to see it as a valuable piece of the puzzle, that allowed them to circumvent the challenge of being a teacher and an observer at the same time. It also allowed participants to get around logistical challenges of getting into each other's classrooms to observe live lessons; with video they could analyze it together after-the-fact and come very close to the experience of being directly in the classroom. These examples are powerful because they enabled teachers to move away from analyzing paper-based evidence to the more complex task of evaluating performance tasks and in-the-moment demonstrations of student learning.

b) Increased Data Literacy Over Time

Over the two cycles of collaborative action research undertaken in this study, researchers also observed a change in conceptions about research generally – from initially equating 'research' with quantitative methodologies and methods, to accepting qualitative and descriptive data as legitimate data sources. We theorize that part of this shift involved teachers coming to identify themselves as researchers. Initially, teachers had difficulty visualizing themselves as researchers, and relating research to what they normally do in the classroom: articulate goals for student and/or teacher learning; assess a beginning point for students/teachers through formative assessment (pre-intervention measures); develop and implement programming to address learning goals and needs (the action research interventions); and assess student/teacher learning (post-intervention measures to assess the effects of the intervention).

Teachers had learned from their experience in cycle 1 about the details of classroom research: They noted the importance of knowing exactly what they were collecting and why, and organizing the data throughout the project in cycle 2. Many teams established central binders or boxes where teams deposited their student samples and other forms of data as well as data summaries.

Not only did teams collect data systematically in cycle 2, but they also examined the data during the action research cycle. This is an ideal action research practice that enables participants to refine their interventions throughout the cycle rather than "at the end".

Reflecting on cycle 1, participants observed that they had collected too much, and were overwhelmed with data that they didn't know how to measure:

> *Our research questions were too big for the time and resources that we have, especially that first year. We had too much data and it was too prescriptive to start with. And we really ran into issues with how to measure and how to report. And the teacher intensity was too involved. Parts of it fell apart because we just could not follow through…. still that issue of, did we really measure the question? And then we'd also collected student work and what to do with it? And how is the student work we collected measuring the question?*

By cycle 2, teachers realized that they needed to manage this through their research design and dealt with the data problems in two ways: 1) by narrowing their research question, and; 2) by focusing intensively on a few carefully chosen students (rather than collecting class sets of data). The first strategy for managing the amount of data collected – narrowing the question – seemed fairly self evident to groups after their first year of action research:

> *Data collection was easier this time. Just because we were more focused and we knew exactly where we were [going]…our question was more focused.*

The second strategy for managing the amount and quality of the data – focusing intently on some carefully chosen students – was also effective. Teachers reflected on the importance of focusing their data collection on a few students for efficiency's sake, but they also recognized that focusing on a few students allowed them insights into how children learn mathematics overall:

> *The amount of data you would collect for the whole class would be unwieldy. These indicator students give a representative sample of how your whole class is progressing and understanding the concepts that we are teaching.*

The sustained activity of teachers as researchers ultimately transformed teacher understanding of data from a foreign, isolated activity that was separate from regular practice and action research, to understanding data as an integral part of both collaborative action research and regular classroom practice.

Collaboration

Learning Together: The power of collaboration in collaborative action research

The collaborative nature of this work was clearly a powerful mechanism for participant professional growth. Teachers reported feeling motivated by their work together, feeling affirmed that they weren't in it alone, that they were inquiring into topics and areas that colleagues also felt strongly about: "it's motivating too, having other people around that are interested in the same things as you. It makes you feel like you're thinking about the right things, and this isn't off base." (Teacher, focus group interview)

> *"It makes a difference that other people are taking that same journey with you…""…that you are not alone."*
> *"That's the point, because if that was a disaster, what are we going to do. Even if it was my classroom, we as a team had to come up with, what are we going to do to make it not a disaster?" (Teacher discussion, Final focus group interview)*

a) Mutual Support and Shared Ownership

Teachers supported each other in different ways. In some instances this support was direct such as visiting one another's classrooms to help teach or observe a lesson. At other times, the support was less direct and took the forms of (i) debriefing in team meetings, (ii) sharing observations from lessons or from video episodes that helped to illuminate student understandings and misconceptions, and (iii) taking on various jobs that needed to be done to move the project forward.

Teachers saw each other as mutually supportive. Shared ownership of the project as well as a shared sense of responsibility for student success in general and in the project in particular, allowed teachers to make themselves vulnerable. Through their work together, they began to feel comfortable acknowledging gaps in knowledge or understanding, because they realized that they would be supported rather than judged and that team members would help to find answers. This led to a decrease in anxiety and a willingness to take further risks in the learning process.

Diversity of Perspectives

Team members appreciated the diversity of ideas that their colleagues brought to the table, and saw the contributions of their colleagues as bringing a richness of perspectives to the process of learning:

> *It's the key, because the diversity of ideas that are generated really supports a more in depth and thorough study. I think if it was just me, myself and I doing this, the breadth of the investigation wouldn't be as great and the learning wouldn't be as great. The reality is and studies*

> *prove that the more ideas, the more brains there are, the better the product. (Teacher, final interview)*

These types of statements show that the value of member contributions went beyond mutual support. Researchers observed groups who were increasingly willing to bring a critical stance to the table, to ask difficult questions, and this was highly valued in the cultures of learning being established by the teams:

> *We ask each other more challenging questions. Someone would bring something forward and then someone would challenge it. And that's what kind of kept us moving to look at all different areas, not just go in one direction. …we were comfortable as a group with each other. (Teacher, final interview)*

b) Learning from One Another

In many cases, in addition to learning from the experience of trying interventions with students and measuring changes throughout the inquiry process, teachers were learning directly from each other. They had opportunities to see respected colleagues trying things to improve their practice, and this gave some the confidence to try high-risk, high-yield strategies themselves:

> *So I think one period of problem solving is more powerful than 20 pages of kill and drill. I don't think that I thought that I could teach using problem solving solely, and not necessarily solely but putting such an emphasis on it. But I've seen M do it. I've seen L do it. And that's given me confidence to try it. Because up until that point I think I thought that it had it's place, but that you needed to have the fundamentals before you could do it. Rather than learn the fundamentals while you're doing it. So I think that big movement in my instruction has come through that. (Teacher, final interview)*

Classroom research: Closing the gap between research and practice

Collaborative action research reduces the historical gap between teaching and research because it involves direct involvement of teachers in research and direct involvement of researchers in teaching (Hubbard and Power 1999; Ross, Rolheiser and Hogaboam-Gray 1999; Sagor 1992; Wells 1994; Whitehead and McNiff 2006). Forging mutually beneficial relationships between teachers and researchers in the education community has proven to be a challenging enterprise. Historically, teachers and researchers have established their own worlds, their own communities of practice, their own ways of operating and communicating. The gap in communication identified by many educators and educational researchers results in a silo effect, where teacher knowledge remains at the practitioner level, researcher knowledge stays at a conceptual level, and each hold limited relevance on the other domain. Hayes and Kelly (2000) identified this as a division of labour between concept and practice in education. Further, some teachers feel that they have been treated as subjects in educational research with unrealistic demands of what they can and should do (Vaughn 2000).

By contrast, within the framework of collaborative action research, teachers and researchers work together ***in the classroom*** to explore problems, challenges and questions (Capobiano, 2007; Frankham and Howes 2006).

In an immediate sense, teachers and researchers both benefit from the partnership. For example, teachers have insights into their classroom contexts, the students they teach and pedagogy that makes them experts in these areas, but they may have more to learn about data collection and analysis. Researchers have insights into data collection and analysis strategies and offer another perspective on classroom activity, but may have more to learn about specific classroom contexts and learning trajectories of students and teachers. Ross, Rolheiser and Hogaboam-Gray (1999) identified three specific benefits of collaborative action

research partnerships. First, partnerships help overcome obstacles such as a lack of skill in methods, lack of contextual understanding of the classroom, or lack of teacher time. Second, contact between researchers and teachers through joint research strengthens the image of the teacher as researcher, and the researcher as learner. A third benefit is the heightened attention given to a project with external resources, which may support administrators in releasing teachers to engage in this form of professional learning.

Situated learning: importance of being in the classroom

According to Lave and Wenger's (1991) seminal work, situated learning occurs within communities of practice at the site at which the learner actually performs the activity of concern. The learning is not transmitted from one person to another, but socially co-constructed through participation, observation and discussion. Our research affirms the potential of collaborative action research for powerful learning when the classroom is the primary focus of study. Teacher teams who were able to either directly observe one another and students in the classroom or to indirectly observe student learning in the form of some kind of visual evidence (such as photographs or video episodes) were more collaborative, more excited about their collaboration, had greater ownership over the process and were willing to take more risks in trying new things in their teaching. This pattern seemed to hold true whether direct or indirect observation occurred on one or on a number of occasions, and seemed to have the same effect for the observer as well as the teacher being observed (in cases where there were limited opportunities for observation and not all classrooms had the opportunity to be observed). The most important factor was that at least some visual evidence of classroom practice and student work was shared in team meetings, which allowed team members to literally see what was happening in one another's classrooms.